

**United States
Department of Agriculture
Forest Service—Engineering**



**Remote Sensing
Applications Center**

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Forest Service Image Acquisition Handbook— Version 1.0

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For additional information, contact Henry Lachowski, Remote Sensing Applications Center, 2222 West 2300 South, Salt Lake City, UT 84119; phone: 801-975-3750; e-mail: hlachowski@fs.fed.us. This publication can be downloaded from the RSAC Web site: <http://fsweb.rsac.fs.fed.us>

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Introduction

Forest Service personnel can use this handbook as a simple how-to guide for obtaining different types of imagery. Any search for imagery should include contacting your [regional remote sensing personnel](#). The more common types of imagery used by the Forest Service are listed in this document. We recommend using the PDF version of this document, which contains many hyperlinks to sections within the document as well as external internet websites.

Each imagery product's page has the following format:

1. Description of satellite and/or sensor
2. Description of imagery product
3. How to obtain the imagery – may contain hyperlinks to order forms, ordering websites, email addresses
4. Prices – approximate prices and pricing structures of the more common products
5. Notes – special notes about ordering, product minimums, etc.
6. Links – hyperlinks to sensor- and/or satellite-specific websites or additional information

Links Color Legend:

[External link to website, email address, or document \(hosted by external site\)](#)

[External link to a document \(outside of this document\)](#)

[Internal link within this document](#)

This document's links are current as of April 15, 2005. Prices listed within are to be used as a guideline and are not actual quotes. Changes in prices will not be immediately reflected within this document.

Introduction

Needs Assessment for Use of High Resolution Imagery

The following set of questions and answers may be helpful in assessing your imagery needs. Simply follow the links for a brief answer to each question below.

How can I tell if high resolution imagery is for me?

- What am I trying to map?
- How much detail do I really need?
- Is the extra detail of the imagery worth the extra cost of the data?
- Do I have the means to extract the kind of information I am interested in?

I have decided to use high resolution imagery; what should I consider BEFORE purchasing the imagery?

- What will I be using the imagery for?
- Am I properly equipped to work with the data?
- How large is the area I am mapping?
- How much money do I have to spend?
- How big of a rush am I in?

What other things do I need to consider when I set up my order?

- What time of year should I acquire the imagery?
- Should I acquire panchromatic, multispectral, or both?
- What are the differences between the “bundle,” “color,” and “pan-sharpened” products?
- How much pre-processing do I need?

How can I tell if high resolution imagery is for me?

What am I trying to map?

High resolution (1-5 meter spatial resolution) imagery is most appropriate for the identification and assessment of features that are too small for moderate resolution imaging systems (e.g., Landsat TM and SPOT 1-4 sensors) to detect. Examples include small landscape features such as individual trees or plants. Moderate resolution sensors typically have less spatial detail but greater scene size. The resultant spatial resolution means that ground spectral information represents averages of different features and phenomena.

How much detail do I really need?

The amount of detail you need depends on the objective of your project, the data standards you are trying to follow, and the scale at which the final mapping products will be displayed. For example, at certain scales (e.g., 1:24,000) it is not possible to detect the difference between 1-, 5-, and 10-meter data. As a general rule, to detect a known object, it is best to choose a pixel size that is half the width (1/4 the area) of the smallest object you are trying to detect. Detection is not the same as characterization, however. If you want to partially or completely characterize an object, you will need to choose a finer resolution than half the width of that object.

Is the extra detail of the imagery worth the extra cost of the data?

It is important to realize that more is not always better. There are tradeoffs to using higher resolution imagery. File size dramatically increases with added ground detail. This requires more computer disk space and processing power if you plan to do anything other than display the data. At 1-meter resolution, a tree feature is comprised of several pixels, each pixel detecting a part of the tree. If you are planning to use an automated approach to feature extraction and image classification, this added detail requires special extraction and classification techniques beyond what a standard per pixel classifier can do. On the other hand, the added detail can provide more

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information about the features you are interested in. Be sure to think through what information you need to answer the questions you are asking. Look at samples of different resolutions of imagery and see what resolution best addresses your problem.

Do I have the means to extract the kind of information I am interested in?

Depending on the product you purchase, it may be comprised of multiple files that need to be imported and layer-stacked before they can be viewed properly. The data may need additional geographic registration or co-registration with other images and GIS datasets. In addition to preparing the data for use, feature extraction and/or image classification may also be an objective. All of these tasks require some form of GIS/remote sensing software and an understanding and knowledge of remote sensing, image processing, and GIS. The more you are planning to do with the imagery, the more you need to know.

I have decided to use high resolution imagery; what should I consider BEFORE purchasing the imagery?

What will I be using the imagery for?

What you wish to do with the imagery will dictate which product you purchase. For a “pretty picture” or a backdrop for display purposes, the most basic product may be all you need, and a single layer “color” image should work fine. If you want to derive new GIS layers or perform feature extractions and image classifications, a higher level (orthorectified) product will likely be required. In terms of spectral resolution, Quickbird and Ikonos collect data in the visible color (blue, green, and red) and near-infrared spectrums. Landsat TM and SPOT have spectral bands beyond that, in the mid-infrared data range. Make sure that the features you are interested in are detectable with the spectral bands available.

Am I properly equipped to work with the data?

Depending on the product you purchase, the format you specify, and what you plan to do with the data, you will require a certain level of image processing expertise, hardware (important for processing and storing data), and software to work with the data. Those with little or no image processing skills may be forced to purchase higher level products that are already accurately georeferenced and essentially “map ready.” Those with advanced image processing skills will have more freedom because they can purchase the most basic product and do much of the additional georeferencing themselves, assuming they have appropriate hardware and software. For sizeable amounts of data, you will need a large amount of disk space and a powerful CPU.

How large is the area I am mapping?

The size of the area will impact the cost of the data, which may influence the type of product you choose. Data storage and management are also important considerations for this question. QuickBird and Ikonos panchromatic imagery is approximately one megabyte in file size per square kilometer of image coverage. The four-band multispectral data is .25 megabytes per square kilometer.

How much money do I have to spend?

This may be the limiting factor in deciding if high resolution imagery is an option for you. It may also greatly influence the type of product you purchase. New QuickBird and Ikonos imagery starts at \$22.50 and \$18.00 per square kilometer, respectively. These are their most basic products that have horizontal ground accuracies of 25-50 meters. These products have not been terrain corrected and are not “map ready.” The higher-end products that have been terrain corrected, with horizontal accuracies of 10 meters, may cost up to \$50.00 and \$35.00 per square kilometer, respectively. Depending on the size of your area of interest and the type of product you choose, this imagery

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can quickly become very expensive. Be careful not to buy something that that you cannot work with!

How big of a rush am I in?

If you need imagery collected rapidly, be prepared to pay 20-100% more for your data. If possible, do a feasibility study to determine when the quickest acquisition can be made without making it a “priority” task. If you have a little time flexibility, it is definitely to your advantage.

What other things do I need to consider when I set up my order?

What time of year should I acquire the imagery?

As with any imagery data acquisition, timing is always important. Time of year, phenological events, and weather (e.g., snow on the ground) can make the difference between useful and useless imagery. Depending on what you are trying to map and identify, the time of year that the imagery is acquired can be crucial. For change detection projects, time of year and anniversary dates are critical for optimal results. For the best results, be sure to think this through carefully and plan ahead. Determine your optimal collection window and negotiate a contract well before that collection window comes up.

Should I acquire panchromatic, multispectral, or both?

This will depend on what you plan to do with the imagery. If you are interested in updating road features, high resolution panchromatic imagery may be suitable for you. If you are trying to identify specific vegetation characteristics, a multispectral or a combination of both panchromatic and multispectral imagery may best meet your needs.

What are the differences between the “bundle,” “color,” and “pan-sharpened” products?

The “bundle” product contains the panchromatic and multispectral data delivered in separate files – essentially two datasets. The datasets can be viewed separately or resolution merged if you have the proper image processing software. The “color” products are multispectral files that have been merged with the panchromatic data to produce a sharpened multispectral image. Space Imaging (Ikonos) offers a three-band combination (red/green/blue or near-infrared/red/green) and a four-band combination (near-infrared/red/green/blue). DigitalGlobe (QuickBird) offers “color” products only as three-band combinations (true color and color-infrared). To get a four-band product, you will need to order their pan-sharpened product. SPOT does not offer any pan-sharpened products or orthorectified bundle products.

How much pre-processing do I need?

This will depend on the amount of image processing experience you have and what you plan on doing with the data. If you have the skills or have access to people who have image georeferencing skills, you may be able to obtain better results by pre-processing the imagery yourself. If you don’t have these skills or access to someone who has them, it may be best to order one of the high-end products that will have the reference accuracy you need.

Price Comparison Chart

This price comparison chart does not include every product that is available from each sensor. The products included on this chart are representative of the least expensive product available.
Green text links to appropriate section within this document.

Satellite / Sensor	Product	Min Order Size	< \$100	\$100 - \$500	\$500 - \$1,000	> \$1,000
Landsat 5	Systematic correction	Full scene (31,000 km ²)		GloVis		
				Earth Explorer		
	MRLC: Terrain corrected	Full scene	RSAC Image Archive		MRLC Consortium	
			MRLC Data Archive			
	MRLC: At-sensor reflectance	Full scene	MRLC Data Archive		MRLC Consortium	
	USGS: Precision corrected	Full scene	USDA Image Archive			EROS Data Center
USGS: Terrain corrected	Full scene				EROS Data Center	
Landsat 7 Prior to May 31, 2003	Raw uncorrected	Full scene (31,000 km ²)		GloVis		
				Earth Explorer		
	Systematic correction	Full scene			GloVis	
					Earth Explorer	
	MRLC: Terrain corrected	Full scene	RSAC Image Archive		MRLC Consortium	
MRLC Data Archive						
USGS: Precision corrected	Full scene	USDA Image Archive				
Landsat 7 After May 31, 2003	Raw uncorrected	Full scene		GloVis		
				Earth Explorer		
	Systematic correction	Full scene		GloVis		
				Earth Explorer		
	Systematic correction Gap-filled	Full scene		GloVis		
			Earth Explorer			
MRLC: Terrain corrected	Full scene	RSAC Image Archive		MRLC Consortium		
		MRLC Data Archive				
SPOT 5	SPOT scene	Full scene	USDA Image Archive			
		1/8 scene				Terra Image USA
		750 km ²				Terra Image USA
SPOT 2-4	SPOT scene	Full scene	USDA Image Archive			Terra Image USA
		750 km ²				Terra Image USA
ASTER	Archived data	Full scene (3,600 km ²)	GloVis			
			EOS Data Center			
	New acquisition	Full scene		GPR Office		
MODIS	All products	5 min scene Full swath	GloVis			
			EOS Data Center			
QuickBird	Standard pan-bundle	25 km ²			Digital Globe	
	Standard	25 km ²		Digital Globe		
ALI	Archived data	Full scene (1,544 km ²)	GloVis			
			Earth Explorer			
	New acquisition	Full scene				DAR

Price Comparison Chart

Satellite / Sensor	Product	Min Order Size	< \$100	\$100 - \$500	\$500 - \$1000	> \$1000
Hyperion	Archived data	Full scene (323 km ²)	GloVis			
			Earth Explorer			
	New acquisition	Full scene				DAR
AVIRIS		Flightline		Order form		
IKONOS	Geo 1 m or 4 m (panchromatic or multispectral)	49 km ²		Carterra Online		
	Geo 1 m or 4 m (color merged)	49 km ²		Carterra Online		
IRS 1C/1D	Geo 5 m	4,900 km ²				Carterra Online
ResourceSat		Full scene	USDA Image Archive			Space Imaging

Regional Remote Sensing/Imagery Contacts

Current as of March, 2005

R1: Northern Region

Geospatial Group Leader..... [Don Patterson](#)..... 406-329-3430
GIS Remote Sensing..... [Geno Bassette](#)..... 406-329-3222
GIS Remote Sensing..... [Jim Barber](#) 406-329-3093
GIS Remote Sensing..... [Bill Kirchhoff](#)..... 406-329-3043

R2: Rocky Mountain Region

Geospatial Services Manager..... [Robert Aiken](#)..... 303-275-5200
Remote Sensing Coordinator..... [Melinda McGann](#) 303-275-5211

R3: Southwestern Region

Geometronics Group Leader..... [Bill Krausmann](#) 505-842-3846
GIS/Remote Sensing Coordinator..... [Tom Mellin](#) 505-842-3845

R4: Intermountain Region

Geospatial Team Leader..... [Roberta Quigley](#) 801-625-5188
Remote Sensing Coordinator..... [David Prevedel](#)..... 801-625-5660
Cartographer & Visual Arts Team Leader... [Sean Harwood](#) 801-625-5213

R5: Pacific Southwest Region

Geometronics Group Leader [Rich Spradling](#) 707-562-8883
Remote Sensing Lab Section Head [Ralph Warbington](#)..... 916-286-7883
Remote Sensing Lab Project Leader [Brian Schwind](#)..... 916-454-0805
FHP Remote Sensing Program Manager.... [Lisa Fischer](#)..... 916-454-0803

R6: Pacific Northwest Region

Geospatial Services Program Manager [Kim Rivard](#) 503-808-2294
Remote Sensing Coordinator..... [Michael Golden](#) 503-808-2324
Remote Sensing Specialist [Dave Vanderzanden](#) 506-808-2863

R8: Southern Region

Engineering Deputy Director/Geospatial..... [Elizabeth McMullen](#) 404-347-2583
Remote Sensing Coordinator [Renee Jacokes](#) 404-347-2588

R9: Eastern Region

Geospatial Services Program Manager [Dennis Kantan](#) 414-297-3520
GIS/Remote Sensing [Bob Carr](#)..... 414-297-1057
Regional GIS Coordinator [Michael Martischang](#) 414-297-1384
NRIS Coordinator [Wanda Hodge](#) 414-297-3806

R10: Alaska Region

Group Leader, Geospatial Applications [Joe Calderwood](#) 907-586-7966
Remote Sensing Coordinator..... [Mark Riley](#) 907-586-8759

Landsat

Thematic Mapper (TM) and Enhanced Thematic Mapper (ETM+)

Landsat satellites use the [Worldwide Reference System \(WRS\)](#) of scenes divided up into paths and rows. The 16-day ground coverage cycle for Landsats 4-7 is accomplished in 233 orbits. Thus, the WRS is made up of 233 paths numbered 001 to 233, east to west, with Path 001 crossing the equator at 64.60 degrees west longitude.

Every 16 days, a Landsat satellite returns to its starting point and repeats the cycle. Working together, Landsats 5 and 7 offer repeat coverage of any location every eight days (Landsat 5 data is limited to direct downlinks). At the equator, the ground track separation is 172 km, with a 7.6 percent overlap. This overlap gradually increases as the satellites approach the poles, reaching 54 percent.

Landsat 5 (TM) vs. Landsat 7* (ETM+)

The Thematic Mapper (TM) is an advanced, multispectral-scanning, Earth resources sensor designed to achieve higher image resolution, sharper spectral separation, improved geometric fidelity and greater radiometric accuracy and resolution than the MSS sensor (also onboard Landsat 5).

Landsat 5

Launched: March 1, 1984
Image Size: 185 x 172 km
Revisit Time: 16 days
Pointable: No
Programmable: No

Band	Band Width (µm)	Resolution
1	0.45 - 0.53	30 m
2	0.52 - 0.60	30 m
3	0.63 - 0.69	30 m
4	0.76 - 0.90	30 m
5	1.55 - 1.75	30 m
6	10.40 - 12.50	120 m
7	2.08 - 2.35	30 m

Landsat 7

Launched: April 15, 1999
Image Size: 183 x 170 km
Revisit Time: 16 days
Pointable: No
Programmable: No

Band	Band Width (µm)	Resolution
1	.45 to .515	30 m
2	.525 to .605	30 m
3	.63 to .690	30 m
4	.75 to .90	30 m
5	1.55 to 1.75	30 m
6	10.40 to 12.5	60 m
7	2.09 to 2.35	30 m
Pan	.52 to .90	15 m

* Landsat 7 experienced a failure of the Scan Line Corrector in May of 2003. See [Appendix](#) for details.

Landsat: RSAC Image Archive

The Image Archive is a collection of Landsat satellite images held by the USDA Forest Service Remote Sensing Applications Center (RSAC). RSAC acquired the images as part of many different programs and projects. Currently, the archive consists only of Landsat imagery; other types of imagery (SPOT, MODIS, etc.) will be added at a later date.

How to order:

- Check the [RSAC Image Archive website](#).
- If the scene you want is in the RSAC Image Archive, you can order directly from the RSAC Image Archive website.
- Data is currently delivered only on CD.

Price:

- The imagery is provided at no cost to the requesting Forest Service office.

Notes:

- Landsat imagery can be shared with cooperators who intend to use the data for non-commercial purposes.
- When RSAC purchases new imagery, it will be added to the archive.
- Forest Service field units may submit imagery to the archive for distribution to other units.

Links:

- [RSAC home page](#)
- [RSAC Image Archive](#)

Landsat: USDA Image Archive

The Foreign Agriculture Service serves as the repository and manager of the USDA Satellite Imagery Archive. Access is available to USDA subscribers only. The Archive was established in 2001 as a cost-sharing agreement among the subscribers. The archive contains data from Landsat, SPOT, AVHRR, and Resourcesat.

How to order:

- Check the [USDA Image Archive website](#).
- If the scene you want is in the USDA Image Archive, send an email to Imagery.Archive@fas.usda.gov with the following information:
 - Image name
 - The path, row and date of image
 - Shipping address
- Data is currently available only on CD or DVD.

Price:

- The imagery is provided at no cost to USDA subscribers.

Notes:

- Imagery can be shared with cooperators who intend to use the data for non-commercial purposes.
- Landsat image products are [precision corrected](#), including radiometric and geometric correction, as well as using ground control points (GCPs) to improve accuracy.

Links:

[Foreign Agriculture Service home page](#)
[USDA Image Archive](#)
[Landsat Product Descriptions](#)

Landsat: MRLC 2001 Data Archive

The Multi-Resolution Land Characteristic (MRLC) 2001 dataset is a follow-up to the successful MRLC 1992 dataset. MRLC consortium agencies have joined together to purchase Landsat 7 ETM+ data from three dates in the year 2001 for each path/row in the 50 states.

Products available through MRLC data archive:

Terrain Corrected has noise removed and geometric registration with terrain correction performed according to documented methods.

At-Sensor Reflectance corrects for sun illumination angle effect by converting DN to at-sensor reflectance. This correction substantially improves scene mosaics and is therefore useful for regional applications. At-sensor reflectance images are more appropriate for land cover and land cover change analysis than the original DN images.

How to order:

- Check the [MRLC data archive website](#).
- If the scene you want is part of the MRLC 2001 data archive, you can order directly from the MRLC 2001 website.
- You will be asked to fill out a Certification form to verify that you work for a MRLC consortium agency; the Forest Service is a part of the consortium.
- You have to fill out the Certification form each time you order from the MRLC dataset.
- Data can be delivered via CD or FTP.

Price:

- Scene price: \$45 per scene
- Media charge: \$30 for FTP; \$45 per CD; \$60 per DVD
- Handling fee: \$5
- MRLC archive accepts credit cards
- Examples:
 - 1 Scene on CD: $\$45 + \$45 + \$5 = \95
 - 2 Scenes via FTP: $\$90 + \$30 + \$5 = \125

Preprocessing:

- MRLC standard preprocessing routine.
- Geometric terrain-corrected registration to within one pixel spatial accuracy.
- Data referenced to the National Albers Equal map projection.
- Imagery re-sampled using cubic convolution to 30-meter pixels.
- All TM bands are processed (including thermal).

Landsat: MRLC 2001 Data Archive

Notes:

- Forest Inventory and Analysis (FIA) is the sponsoring group within the Forest Service.
- The DEM used for terrain correction is included.
- MRLC uses a standard preprocessing routine; therefore, if you need a different projection or resampling method, you will have to acquire the imagery from another source.
- MRLC 2001 Landsat 7 data is available to any user and is under no data distribution restriction. The data is to be used or disseminated with the intent of use for scientific purposes and only for a non-commercial venture.

Links:

[USGS Landsat home page](#)

[MRLC data archive website](#)

Landsat: FS-MRLC Consortium Agreement

If your desired image is not part of the MRLC archive, Forest Service personnel can order Landsat 7 imagery under the FS-MRLC Consortium Agreement through the Remote Sensing Applications Center (RSAC). Imagery ordered through the consortium agreement automatically becomes part of the MRLC data archive.

How to order:

- Use the [Earth Explorer](#) website or [GloVis](#) to identify suitable imagery.
- Email your request to Brad Quayle, Acting RSAC Operations Program Leader (bquayle@fs.fed.us).
- In your email, include the following information for each scene you want to order:

Required Information Example	
Path/row	38/29
Acquisition date	10/20/2001
Scene ID	7038029000126350
Management code	ABCD12
Override code	1234
Name	Joe Raster
Shipping address	123 Wide Rd
Phone number	555-555-5555

- Data can be delivered via CD or FTP.
- RSAC will order the imagery under the FS-MRLC Consortium agreement. The full amount of the order will be charged to the management code you provide.

Price:

- Scene price: \$500 Landsat 5; \$640 Landsat 7
- Copy charge: \$45 per scene
- Delivery charge: \$30 via FTP; \$45 via CD; \$60 via DVD
- Handling fee: \$5
- Examples:
 - 1 Landsat 5 scene on CD: $\$500 + \$45 + \$45 + \$5 = \$595$
 - 2 Landsat 7 scenes via FTP: $\$1,280 + \$90 + \$30 + \$5 = \$1,405$

Preprocessing:

- MRLC standard preprocessing routine
- Geometric terrain-corrected registration to within one pixel spatial accuracy
- Data referenced to the National Albers Equal map projection
- Imagery re-sampled using cubic convolution to 30-meter pixels
- All TM bands are processed (including thermal)

Landsat: FS-MRLC Consortium Agreement

Notes:

- The DEM used for terrain correction is included.
- MRLC uses a standard preprocessing routine; therefore, if you need a different projection or resampling method, you will have to acquire the imagery from another source.
- Imagery purchased under the FS-MRLC Consortium agreement becomes part of the MRLC archive.
- Imagery purchased under the FS-MRLC Consortium agreement is available to any user and is under no data distribution restriction. The data is to be used or disseminated with the intent of use for scientific purposes and only for a non-commercial venture.
- Prices listed are for a delivery/shipping time of 72 hours. Delivery within 24 hours is subject to additional charges.

Links:

[USGS Landsat home page](#)

[Earth Explorer website](#)

[GloVis](#)

Landsat: Earth Explorer / GloVIS

The USGS sells all Landsat imagery from their Earth Explorer website. This is the best option if you prefer preprocessing methods other than the MRLC standard routines.

Landsat Products Available through Earth Explorer

Raw Uncorrected (Level 0Rp) has no radiometric or geometric correction applied. Scan lines are reversed and nominally aligned. Image data is provided in 8-bit unsigned integer (DN) values.

Systematic Correction (Level 1G) includes both radiometric and geometric correction. The scene will be rotated, aligned, and georeferenced to a user-defined map projection. Absolute geometric accuracy of the systematically corrected TM product can vary, depending upon the accuracy of the predicted ephemeris that is used for processing. If the image was acquired in **SLC-off**¹ mode, a scan gap mask will be included with the final product.

Systematic Correction (Level 1G) Gap-filled (SLC-off only) includes radiometric correction, geometric correction, and replacement of all missing image pixels within the SLC-off ("primary") scene with estimated values based on histogram-matched data from one or more user-defined "fill" scenes acquired on a separate date. The image will be rotated and aligned to a user-specified projection. A scan gap mask is included with the final product. All Level 1G SLC-off gap-filled products are processed by the Level 1 Product Generation System.

Precision Correction (Level 1P) includes radiometric and geometric correction, as well as the use of ground control points (GCPs) to improve accuracy. For locations outside the US, accuracy of the precision-corrected product will depend upon the availability of local GCPs. All Level 1P products are processed by the National Land Archive Production System.

Terrain Correction (Level 1T) includes radiometric, geometric, and precision correction, as well as the use of a digital elevation model (DEM) to correct parallax error due to local topographic relief. For locations outside the US, the accuracy of the terrain-corrected product will depend upon the availability of local ground control points (GCPs), as well as the resolution of the best available DEM. All Level 1T products are processed by the National Land Archive Production System.

How to order:

- Use [GloVis](#) or the [Earth Explorer](#) website to identify suitable imagery.
 - Order directly from the GloVis or Earth Explorer website.
- Precision-corrected and terrain-corrected products must be ordered through the [USGS EROS Data Center](#) directly.

¹ Applies to Landsat 7 products only.

Landsat: Earth Explorer / GloVIS

Prices per scene:

- Landsat 5
 - Systematic correction – \$ 425
 - Precision corrected – \$550
 - Terrain corrected – \$625
- Landsat 7
 - Prior to May 31, 2003
 - Raw uncorrected – \$475
 - Systematic correction – \$600
 - After May 31, 2003
 - Raw uncorrected – \$200
 - Systematic correction – \$250
 - Systematic correction gap-filled – \$300
- \$5 handling charge/order
- Bulk orders (25 or more Landsat scenes) cost 80% of the standard scene pricing.
- Earth Explorer accepts credit cards.

Preprocessing:

- Datum – options are WGS84, NAD83, or NAD27
- Map projection – options are Space Oblique Mercator or UTM
- Pixel size – options are 25, 28.5, 30, 57, or 60 (all are in meters)
- Resampling technique – options are Cubic Convolution or Nearest Neighbor
- Image orientation – options are SAT (nominal system orientation) or MAP (north up orientation)
- Product format
 - Landsat 5 – NLAPS, GeoTIFF, or EFF (EOSAT Fast Format)
 - Landsat 7 – NLAPS

Notes:

- Precision-corrected and terrain-corrected products from Landsat 7 are not available to agencies outside of the USGS.
- Imagery ordered directly from Earth Explorer or GloVis is not terrain corrected; you will have to do the terrain correction yourself or contract with a third party vendor.

Links:

- [USGS Landsat home page](#)
- [Earth Explorer website](#)

SPOT

(Satellite Probatoire d'Observation de la Terre)

High resolution, stereo imaging and revisit capability are features of the SPOT system. The SPOT satellite Earth Observation System was designed by the **Centre National d'Etudes Spatiales (CNES)**, the French Space Agency, and developed with the participation of Sweden and Belgium. SPOT's oblique viewing capacity allows it to image any area within a 900-kilometer swath. Oblique viewing can be used to increase the viewing frequency for a given point during a cycle.

SPOT 1-3

Launched: February 22, 1986; January 22, 1990; September 26, 1993

Revisit Time: 2-3 days

Image Size: 60 x 60 km

Pointable: Yes

Programmable: Yes

Band	Band Width (µm)	Resolution
1	.50 to .59	20 m
2	.61 to .68	20 m
3	.78 to .89	20 m
Pan	.50 to .73	10 m

SPOT 4

Launched: March 24, 1998

Revisit Time: 2-3 Days

Image Size: 60 x 60 km

Pointable: Yes

Programmable: Yes

Band	Band Width (µm)	Resolution
1	.50 to .59	20 m
2	.61 to .68	20 m
3	.78 to .89	20 m
4	1.58 to 1.75	20 m
Pan	.61 to .68	10 m

SPOT 5

Launched: May 4, 2002

Revisit Time: 2-3 Days

Image Size: 60 x 60 km

Pointable: Yes

Programmable: Yes

Band	Band Width (µm)	Resolution
1	.50 to .59	10 m
2	.61 to .68	10 m
3	.78 to .89	10 m
4	1.58 to 1.75	20 m
Pan	.48 to .71	5 m

SPOT Products

SPOT Scene

- *Spatial Resolutions*
 - Black-and-white: 2.5 m, 5 m, 10 m
 - Color: 2.5 m*, 5 m*, 10 m, 20 m

* Except level 1B products

SPOT

(Satellite Probatoire d'Observation de la Terre)

- *Level 1A*: Radiometric correction of distortions due to differences in sensitivity of the elementary detectors of the viewing instrument. Intended for users who wish to do their own geometric image processing.
- *Level 1B*: Radiometric correction identical to that of level 1A. Geometric correction of systematic effects (panoramic effect, earth curvature and rotation). Internal distortions of the image are corrected for measuring distances, angles and surface areas. Specially designed product for photo-interpreting and thematic studies.
- *Level 2A*: Radiometric correction identical to that of level 1A. Geometric correction done in a standard cartographic projection (UTM WGS84 by default) not tied to ground control points. Allowing for possible differences in location, this product is used to combine the image with geographic information of various types (vectors, raster maps and other satellite images).

SPOT View

- *Spatial Resolutions*
 - Black-and-white: 2.5 m, 5 m, 10 m
 - Color: 2.5 m, 5 m, 10 m, 20 m
- *Level 2A*: scenes are rectified to match a standard map projection (i.e., UTM WGS 84), using satellite ephemeris data but not ground control points. For SPOT 1 through SPOT 4, the mean rectification elevation is constant across the scene. For SPOT 5, a global DEM with a post spacing of 1 kilometer is used.
- *Level 2B (Precision)*: This product comes in a map projection with ground control points taken on maps or from GPS-type measurements taken in the field. The image is corrected for a mean elevation in a projection and a standard map frame. This product is used when deformations due to relief are not that important (e.g., flat ground, etc.).
- *Level 3 (Ortho)*: Map projection based on ground control points and a DEM based on Reference3D data to eliminate distortions due to relief.

Vegetation

- SPOT images have a constant resolution of 1 km for the whole field of view of 2,400 km, offering almost daily coverage of the whole of the Earth's surface. The main vegetation missions include continuous, regional and global monitoring of the continental biosphere to supply accurate measurements of the main vegetation coverage characteristics, particularly for agricultural production and the effects of deforestation.

SPOT

(Satellite Probatoire d'Observation de la Terre)

How to order:

- To order SPOT products, contact the Federal Program Sales Director, Curt Derbyshire, at 1-877-320-0344 or curt.derbyshire@terraimageusa.com. When you call, please have the following information ready:

Area of interest

- shapefile with projection information (ideal!)
- coordinates (lat/long)

Desired resolution

 for either panchromatic or multispectral

Date range

 (for archive orders)

Programming level

 (for new acquisitions)

- red or priority (extra cost)
- blue (no charge within North America)

Maximum incidence angle

Up to 31.5 degrees off nadir

Delivery Options

- ftp (free)
- CD/DVD (\$30)

Prices:

- SPOT product prices range between \$1,200 and \$11,750 per scene depending on the following commercial[†] pricing structure:
 - Satellite (SPOT 5 vs. SPOT 1-4)
 - Data Product (SPOT Scene vs SPOT View)
 - Resolution – 2.5 m 5 m, 10 m, 20 m
 - Spectral mode[‡] (color-merge, panchromatic)
 - Scene size (full, 1/2, 1/4, 1/8)
 - Vintage (1986-2002, 2003+)
- SPOT [pricing](#) information linked through Terra Image USA.

Notes:

- SPOT is a tasking satellite; it collects only when ordered. It does not provide continuous coverage of the Earth; therefore, archived images may not contain coverage of your area of interest.
- Through the SPOT Image online catalog [SIRIUS](#), you can find archive images acquired since 1986.
- With its constellation of 3 SPOT satellites (SPOT 2, SPOT 4 and SPOT 5), SPOT Image can offer daily acquisition capability.
- All SPOT products are compatible, which means that the methods developed by users of SPOT 1 to 4 can be applied to any SPOT image.

[†] Prices listed are commercial prices. Prices for government agencies may be cheaper.

[‡] The 2.5 m and 5 m color-merge products are performed by Terra Engine and can be cheaper than the color-merge products produced by SPOT Image directly.

SPOT

(Satellite Probatoire d'Observation de la Terre)

Links:

[Terra Image USA home page](#)

[Pricelist](#) through Terra Image USA

[Pricelist explanation](#) through Terra Image USA

[SPOT home page](#)

ASTER

(Advanced Spaceborne Thermal Emission and Reflection Radiometer)

ASTER is an imaging instrument flying on Terra, a satellite launched in December 1999 as part of NASA's Earth Observing System (EOS). The ASTER instrument provides the next generation in remote sensing imaging capabilities compared with the older Landsat Thematic Mapper, and Japan's JERS-1 OPS scanner. ASTER captures high spatial resolution data in 14 bands, from the visible to the thermal infrared wavelengths, and provides stereo viewing capability for digital elevation model creation.

The ASTER instrument consists of three separate instrument subsystems. Each subsystem operates in a different spectral region, has its own telescope(s), and was built by a different Japanese company.

ASTER's three subsystems are: the Visible and Near Infrared (VNIR), the Shortwave Infrared (SWIR), and the Thermal Infrared (TIR). To find out more about each module click on the item of interest.

ASTER

Launched: December 1999

Image Size: 60 x 60 km

Revisit Time: 16 Days

Pointable: Yes

Programmable: Yes

Band	Band Width (µm)	Resolution	Band	Band Width (µm)	Resolution
1	.52 to .60	15 m	8	2.295 to 2.365	30 m
2	.63 to .69	15 m	9	2.360 to 2.430	30 m
3	.76 to .86	15 m	10	8.125 to 8.475	90 m
4	1.6 to 1.7	30 m	11	8.475 to 8.825	90 m
5	2.145 to 2.185	30 m	12	8.925 to 9.275	90 m
6	2.185 to 2.225	30 m	13	10.25 to 10.95	90 m
7	2.235 to 2.285	30 m	14	10.95 to 11.65	90 m

ASTER Products

Level 1 data are archived and can be searched and ordered.

Higher level, calibrated and derived products are created on-demand for each user. Higher-level products are created on-demand from L1B data, except for the DEM product.

ASTER

(Advanced Spaceborne Thermal Emission and Reflection Radiometer)

How to order:

- Archived data is available through [GloVis](#) as well as the EOS [Data Gateway](#) (link: EOS Data Gateway [Instructions](#)).
- New acquisition
 - Fill out a General Programming Request (GPR) [Order Form](#).
 - Email order form to gpr_office@asterops.ersdac.or.jp.
 - By submitting the form you agree to the [conditions for accepting the Users Programming Request](#).
- The most common way to order Level 2 and 3 products is to do a search for Level 1 data using the Earth Observing System (EOS) Data Gateway. Follow the link to specify and order higher-level products.

Prices:

- Archived – \$60 per scene
- New acquisitions
 - Daytime – 39,200 ¥ ~ \$370 per scene
 - Nighttime – 29,400 ¥ ~ \$275 per scene

Notes:

- ASTER is a tasking sensor; it collects **only** when ordered. It **does not** provide continuous coverage of the Earth. Archived images may not contain coverage of your area of interest.
- For further information on data acquisition contact the GPR Office (in Japan)
 - Tel: +81-3-3533-9388
 - Email: gpr_office@asterops.ersdac.or.jp

Links:

- U.S. Links
 - [Jet Propulsion Laboratory ASTER home page](#)
 - [Archive pricing](#)
 - [EOS Data Gateway](#)
 - [GloVis](#)
- Japan Links
 - [Terms and Conditions of New Acquisition Requests](#)
 - [Acquisition Requests and Pricing](#)
 - [GPR Order Form](#)

India Resource Satellites (IRS)

C1/D1 and Resourcesat

IRS 1C/1D

Each of the 1C and 1D satellites carries three sensors. The Panchromatic sensor collects a single band of imagery with 5.8-meter resolution. The Linear Imaging Self-Scanning-3 (LISS-3) multispectral sensor has a resolution of 20 meters and collects 4 bands of image data in the visible, near-infrared and shortwave infrared portions of the electromagnetic spectrum. The Wide Field Sensor (WiFS) sensor collects low resolution (180-meter) data in the visible red and near infrared portions of the the spectrum.

Launched: December 28, 1995; September 29, 1997

Image Size:

Pan: 70 x 70 km
 LISS-3: 140 x 140 km
 WiFS: 812 x 812 km

Revisit Days: 2 - 4 days

Pointable: No

Programmable: No

Sensor	Band	Band Width (µm)	Resolution
Pan	1	.5 to .75	5 m
LISS-3	B2	.52 to .59	20 m
	B3	.62 to .68	20 m
	B4	.77 to .86	20 m
	B5	1.55 to 1.70	20 m
WiFS	VIS	.61 to .68	180 m
	NIR	.77 to .86	180 m

Resourcesat-1

To maintain continuity with previous IRS satellites, Resourcesat-1 carries three sensors that deliver an array of spectral bands and resolutions ranging from 5.8 meters to 60 meters. The Advanced Wide Field Sensor (AWiFS) has a 56 meter NADIR resolution.

Launched: October 17, 2003

Image Size:

LISS-3: 140 x 140 km
 LISS-4 (mono): 70 x 70 km
 LISS-4 (Mx): 23 x 23 km
 AWiFS: 738 x 737 km

Revisit Days:

LISS-3: 24 Days

LISS-4: 5 Days

AWiFS: 5 Days

Pointable:

LISS-3: No

LISS-4: Yes

AWiFS: No

Programmable:

LISS-4: Yes

Sensor	Band	Band Width (µm)	Resolution
LISS-3	B2	.52 to .59	20 m
	B3	.62 to .68	20 m
	B4	.77 to .86	20 m
	B5	1.55 to 1.70	20 m
LISS-4	Mono	Variable	5 m
	B2	.52 to .59	5 m
	B3	.62 to .68	5 m
WiFS	B2	.52 to .59	56 - 70 m
	B3	.62 to .68	56 - 70 m
	B4	.77 to .86	56 - 70 m
	B5	1.55 to 1.70	56 - 70 m

India Resource Satellites (IRS)

C1/D1 and Resourcesat

IRS 1C/1D and Resourcesat Products

Geo 5-meter products are radiometrically and geometrically corrected, and oriented to a specified datum and map projection system. IRS Geo products are available as individual black-and-white scenes.

Geo 23-meter products are radiometrically and geometrically corrected, and oriented to a specified datum and map projection system. IRS Geo products are available as individual multispectral scenes.

Geo 180-meter is a product from the IRS WiFS sensor that acquires 2 bands of 180-meter multispectral data specifically for vegetation analysis. With an 812-km swath, WiFS is capable of providing vegetation index imagery at the regional level that will help in assessment of crop and drought conditions.

Reference 5-meter products are valuable for users requiring moderate positional accuracy for mapping roadways, pipelines, corridors, and updating existing base maps and feature layers. Colorized data yields information on habitat delineation, ecosystem boundaries, and land use monitoring. The colorization process utilizes pan-sharpening of Landsat true and false color bands with IRS panchromatic data.

Standard 1-meter/5-meter ImageStak combines the benefits of a 5-meter regional base map with the detailed visual and spatial information contained within 1-meter IKONOS Pro imagery of customer-specified areas of interest. This unique combination provides cost-effective access to medium resolution data for county, state, or regional coverage, and it incorporates high-resolution inserts for areas requiring detailed analysis.

How to order:

- Contact the Federal Program Sales Director at Space Imaging and he or she will assist you in getting the correct data.

Prices:

- Geo 5-meter products (panchromatic only) – \$2,500 per 4,900 km² scene

Notes:

- Currently Geo 5-meter products are not available from Resourcesat.
- C1 or D1 minimum order size is one 70 km x 70 km scene.
- Archived images can be viewed online through Space Imaging's [Carterra Online](#).

Links:

- [Space Imaging home page](#)
- [IRS Products via Space Imaging](#)
- [Carterra Online Quick Help](#)

Advanced Land Imager (ALI)

The ALI is a technology verification instrument on board NASA's Earth Observing 1 (EO-1) satellite; it operates in a push-broom fashion at an orbit of 705 km. The ALI sensor provides a ground sample distance (GSD) of 10 meters for the visible panchromatic band (band 1) and a GSD of 30 meters for all other bands (bands 2-10). The spatial resolution of ALI is very similar to Landsat 7 ETM+ (30/15 meters), with the exception of the higher-resolution (10-meter) panchromatic band for ALI. These bands have been designed to mimic six Landsat bands with three additional bands covering 0.433-0.453, 0.845-0.890, and 1.20-1.30 μm . The ALI also contains wide-angle optics designed to provide a continuous $15^\circ \times 1.625^\circ$ field of view for a fully populated focal plane with 30-meter resolution for the multispectral pixels and 10-meter resolution for the panchromatic pixels.

Advanced Land Imager

Launched: November 21, 2000

Image Size: 37 x 42 km

Revisit Time: 16 days

Pointable: No

Programmable: Yes

Band	Band Width (μm)	Resolution
Pan	0.48 - 0.69	10 m
MS - 1'	0.433 - 0.453	30 m
MS - 1	0.45 - 0.515	30 m
MS - 2	0.525 - 0.605	30 m
MS - 3	0.63 - 0.69	30 m
MS - 4	0.775 - 0.805	30 m
MS - 4'	0.845 - 0.89	30 m
MS - 5'	1.2 - 1.3	30 m
MS - 5	1.55 - 1.75	30 m
MS - 7	2.08 - 2.35	30 m

ALI Products

Level 1R product: The ALI product distributed by the USGS EROS Data Center (EDC) consists of radiometrically corrected (Level 1R) data. There is no geometric correction applied and the image is not georeferenced. The Level 1R data is provided in Hierarchical Data Format (HDF) version 4.1r5.

The ALI sensor consists of four separate sensor chip assemblies (SCAs) and, due to this configuration, the ALI Level 1R product is generated as four separate image files (one for each SCA). The user will need to mosaic the four images together in order to obtain a single, contiguous ALI image.

Level 1G product: In addition to the Level 1R product, the USGS EDC now provides a Level 1G (radiometrically corrected, geometrically corrected, and georeferenced) ALI data product. Unlike the Level 1R ALI product, each band within the Level 1G product is provided as a single "stitched" file. The Level 1Gs processing includes cubic convolution (CC) resampling. The data is provided in north-up (NUP) orientation and is georeferenced to the Universal Transverse Mercator (UTM) projection using the WGS84 datum. Default UTM zone is defined at the scene center coordinates. The new Level 1G product is distributed on DVD or FTP in either GeoTIFF or HDF (4.1r5) format.

Advanced Land Imager (ALI)

How to order:

- All publicly available, archived Advanced Land Imager scenes can be searched and ordered through [Earth Explorer](#) or [GloVis](#).
- To request an acquisition from the ALI, a [Data Acquisition Request](#) (DAR) form should be submitted 30 days in advance of the acquisition date.
- A request submitted within 14 days of acquisition will be subject to additional charges.

Prices:

- Archive Orders
 - Level 1R – \$250
 - Level 1G – \$500
- Data Acquisition Request orders
 - 42 km strip – \$1,500
 - 185 km strip – \$2,500

Notes:

- Because ALI is a tasking sensor, it collects only when ordered. It does not provide continuous coverage of the Earth, and archived data may not contain coverage of your area of interest.
- The Level 1R data is provided in Hierarchical Data Format (HDF) version 4.1r5.
- The Level 1G product is distributed in GeoTIFF or HDF (4.1r5) format.

Links to EO-1 and ALI:

[EO-1 Users Guide](#)
[EO-1 home page](#)
[EO-1 FAQ page](#)
[EO-1 Advanced Land Imager page](#)
[DAR Instructions and Pricing](#)
[DAR form](#)

For further assistance, please contact:

Customer Service
U.S. Geologic Survey
EROS Data Center
Tel: 1-800-252-4547
Tel: 1-605-594-6151
Fax: 1-605-594-6589
Email: custserv@usgs.gov

MODIS

(Moderate Resolution Imaging Spectrometer)

MODIS is a key instrument aboard the [Terra \(EOS AM\)](#) and [Aqua \(EOS PM\)](#) satellites. Terra's orbit around the Earth is timed so that it passes from north to south across the equator in the morning, while Aqua passes south to north over the equator in the afternoon. Terra MODIS and Aqua MODIS are viewing the entire Earth's surface every 1 to 2 days, acquiring data in 36 spectral bands.

There are 44 standard MODIS data products that scientists use to study global change. Scientists from a variety of disciplines, including oceanography, biology, and atmospheric science, use these products. For a complete list of products refer to the MODIS [Data Products](#) web page.

MOD09 – Surface Reflectance: This product provides an estimate of the surface spectral reflectance for each band as it would have been measured at ground level if there were no atmospheric scattering or absorption.

MOD13 – Gridded Vegetation Indices (Max NDVI and Integrated MVI): Gridded vegetation-index maps depicting spatial and temporal variations in vegetation activity are derived at 8-day, 16-day, and monthly intervals for precise seasonal and inter-annual monitoring of the Earth's vegetation.

How to order:

- Data is available through [GloVis](#) as well as the EOS [Data Gateway](#) (link: EOS Data Gateway [Instructions](#)).

Prices:

- MODIS data is generally available at no charge if you select the FTP delivery option.

Links:

- [MODIS home page](#)
- [MODIS data products](#)
- [EOS Data Gateway](#)
- [GloVis](#)

QuickBird

The QuickBird satellite is the first in a constellation of spacecraft that DigitalGlobe® is developing that offers highly accurate, commercial, high-resolution imagery of Earth. QuickBird is currently the only spacecraft able to offer sub-meter resolution imagery.

Launched: October 18, 2001
Image Size: 16.5 x 16.5 km
Revisit Time: 1-4 days
Pointable: Yes
Programmable: Yes

Band	Band Width (µm)	Resolution
Pan	0.45 - 0.9	60 - 70 cm
Blue	0.45 - 0.52	2.4 - 2.8 m
Green	0.52 - 0.60	2.4 - 2.8 m
Red	0.63 - 0.69	2.4 - 2.8 m
NIR	0.76 - 0.9	2.4 - 2.8 m

QuickBird Products

Basic Imagery is the least processed of the QuickBird product suite and is corrected for radiometric distortions, internal sensor geometry, optical distortions, and sensor distortions. Basic Imagery is neither geo-referenced nor mapped to a cartographic projection. Basic Imagery is provided with the QuickBird sensor model and is intended for sophisticated photogrammetric processing such as orthorectification. Basic Imagery is a scene-based product, meaning that it can only be ordered in scene increments. Basic Imagery is available as either black-and-white or multispectral products.

Standard Imagery is a geo-referenced product, which is radiometrically calibrated, corrected for sensor and platform-induced distortions, and mapped to a cartographic projection. Standard Imagery is provided with image metadata and is intended for a wide variety of applications. Standard Imagery is an area-based product, meaning that the product is defined by your area of interest without reference to scenes. Standard Imagery is available as either black-and-white, multispectral, color, or pan-sharpened products.

Orthorectified Imagery is a terrain-corrected product, which is radiometrically calibrated, corrected for sensor and platform-induced distortions, and mapped to a cartographic projection. This product is GIS-ready and can be used as an image base map for a wide variety of applications where a high degree of accuracy is required. Orthorectified Imagery is an area-based product, meaning that the product is defined by your area of interest without reference to scenes. Orthorectified Imagery is available as either panchromatic, multispectral, color, or pan-sharpened products.

How to order:

- Fully complete an [order request form](#) for each Area of Interest (AOI).
 - If defining the study area by coordinates, include them in the form in the spaces provided.
 - If defining the area by shapefile, please e-mail to Brett Thomassie the shapefile in the format described in the Ordering Process document.
- Email the form(s) to Brett Thomassie at bthomassie@digitalglobe.com.
- Once the order form and shapefile (if needed) have been received, you will receive a *.pdf file with the cost quotation for each AOI submitted.

QuickBird

If the *.pdf quotations received from Brett Thomassie are acceptable and you would like go forward with the orders:

- Have the bottom of each *.pdf quote signed and faxed (FAX# 985-643-3661) back directly to Brett Thomassie with the preferred method of purchase (credit card, purchase order, etc.) and it will be finalized and processed.
- If a purchase order will be used as the method of payment, please have it faxed directly to Brett. If using a credit card as the method of payment, the card information can be provided at the bottom of the quotation form or over the phone to Brett.

Prices:

- QuickBird product prices can range between \$18.00/km² and \$50.00/km² based on the following price structure:
 - Image library (archived imagery)
 - Standard delivery
 - Rush delivery
 - Satellite tasking
 - Standard tasking
 - Priority tasking
 - Rush tasking

Notes:

- QuickBird is a tasking satellite; it collects **only** when ordered. It **does not** provide continuous coverage of the Earth. Archived images may not contain coverage of your area of interest.
- Minimum order for Basic Imagery (both image library and tasking) is one scene (272 km²).
- Minimum order size for Standard Imagery is 25 km² for Image Library, 64km² for standard and priority tasking, and 100km² for rush tasking orders. All orders must have a minimum 5 kilometers width.
- Minimum order size for Orthorectified Imagery is 100km². Call for quote for smaller order sizes.
- Custom Ortho requires customer supplied DEMs and GCPs.

Links:

Basic Information

[Digital Globe home page](#)

[Product Overview](#)

[Ordering Process](#) (PDF)

[Email order form](#) (ZIP/DOC)

QuickBird

[Products and Documents](#) from DigitalGlobe

[Product Guide](#) (PDF, 1.41 MB)

[FAQ](#) (PDF)

[Ordering SPOT imagery through Digital Globe](#)

[Ordering Landsat imagery through Digital Globe](#)

IKONOS

The IKONOS satellite is the world's first commercial satellite to collect black-and-white (panchromatic) images with 1-meter resolution and multispectral imagery with 4-meter resolution. Both the 1-meter panchromatic and 4-meter multispectral imagery can be combined in a variety of ways to accommodate a wide range of high-resolution imagery applications.

Launched: March 1999
Image Size: 185 x 172 km
Revisit Time: 3 Days
Pointable: Yes
Programmable: Yes

Band	Band Width (µm)	Resolution
Pan	0.45 - 0.9	1 m
Blue	0.45 - 0.52	4 m
Green	0.51 - 0.60	4 m
Red	0.63 - 0.7	4 m
NIR	0.76 - 0.85	4 m

IKONOS Products

Geo 1-meter and 4-meter products are geometrically corrected to a map projection. The correction process removes image distortions introduced by the collection geometry and re-samples the imagery to a uniform ground sample distance (GSD) and a specified map projection. Geo images comprising an order are not mosaicked, and tonal variations may be evident between images.

Geo Ortho Kit images are a subset of the Geo product line. The Geo Ortho Kit is tailored for users, such as photogrammetrists, who want to control the orthorectification process.

Geo Ortho Kit images include the camera geometry obtained at the time of the image collection. With the Geo Ortho Kit, users can produce their own highly accurate, orthorectified products by utilizing commercial off-the-shelf (COTS) software, digital elevation models, and optional ground control.

Standard Ortho 1-meter and 4-meter products are designed for GIS professionals performing basic mapping projects and/or image classification and analysis, and who may not have adequate photogrammetric processing resources available to them.

Reference 1-meter and 4-meter IKONOS products are designed for regional mapping and projects requiring an orthorectified image product of medium scale accuracy.

Pro level IKONOS products are perfect for projects requiring high-resolution imagery and positional accuracy when ground control may be costly, difficult, or impossible to acquire. Pro 1-meter and 4-meter products are the highest accuracy orthorectified products derived from IKONOS imagery that do not require ground control.

Precision 1-meter and 4-meter products utilize ground control to gain added positional accuracy. IKONOS imagery with a 1:4,800 map accuracy supports most regional and large scale urban planning projects. Positional accuracy of 4 meters satisfies the stringent requirements for forestry operations and inventory assessments.

IKONOS

PrecisionPlus is the highest accuracy orthorectified product derived from IKONOS imagery offered by Space Imaging. PrecisionPlus provides spatial accuracy necessary to meet the needs of most urban, cadastral, and infrastructure mapping applications.

How to order:

- Contact the Federal Program Sales Director or Jim Roper* at Space Imaging and he or she will assist you in getting the correct data whether it be archived or new acquisition.

Prices:

- Geo 1 meter and Geo 4 meter (panchromatic or multispectral) – \$343 per 49 km²
- Geo 1 meter and Geo 4 meter (color merge) – \$377 per 49 km²

Notes:

- Minimum order size
 - All orders must have a minimum 5 kilometers width.
 - The minimum order for new collections is 100 square kilometers.
 - The minimum order for archive Geo, Geo Ortho Kit, Standard Ortho and Reference Stereo products is 49 square kilometers.
 - All other archive products have a 100-square kilometer minimum.
- Archived images can be viewed online through Space Imaging's [Carterra Online](#).

Links:

- [Space Imaging home page](#)
- [IKONOS Imagery Products](#)
- [Carterra Online Quick Help](#)

* Jim Roper is the Director of Sales for Space Imaging. As of April 15, 2005 Space Imaging was still looking for a replacement to the previous Federal Program Sales Director.

DOQs & DOQQs

How to order:

- DOQ distribution for the Forest Service is done through the Geospatial Service and Technology Center (GSTC).
- If you don't know the name of DOQ for the area you are interested in, navigate through the [GSTC Data Clearinghouse](#) to find the desired name.
- Fill out the DOQ [Request Form](#) or email the request to wo_gstc_data_library@fs.fed.us with the following information:
 - Name
 - Organization
 - Forest
 - Work phone
 - Email
 - Delivery media (CD or 8 mm tape)
 - Datum (NAD27 or NAD83)
 - List of requested data
 - Job code
 - Shipping address

Price:

- \$5.00 per CD or 8 mm tape (Forest Service media charge)

Links:

[GSTC Data Clearinghouse](#)

[DOQ request page](#)

[DOQ request form](#)

Resource Photography

How to obtain Resource Photography:

- Resource Photography should be available from the Regional Office.
- If the Regional Office does not have it, you can order it directly from the [Aerial Photography Field Office](#).
 - Check the available years by clicking on the *US National Forests* link from the [Ordering Imagery](#) page off the APFO website.
 - To order photographs from APFO, fill out the [Request for Aerial Photography](#) order form and send it via email or parcel mail to:
 - Sales Section
USDA FSA Aerial Photography Field Office
2222 West 2300 South
Salt Lake City, UT 84119-2020
 - sales@apfo.usda.gov
 - Include the following information with the order form:
 - Map of the area of interest in any of the following formats
 - Photocopy of quad with Lat/Lon information
 - ESRI shapefile
 - Township and range location
 - Dates of photography
 - Name of the National Forest

Prices:

- From Forest Office or Regional Office – usually available on loan
- From APFO
 - 10"x10" color photo: \$7.00 per photo
 - 10"x10" black-and-white photo: \$5.00 per photo
 - Scanned photos: \$10.00 - \$18.00 per photo (dpi dependent)

Notes:

- Estimated delivery time is two months.
- As a general rule, the Aerial Photography Field Office archives the negatives for photographs after 1954.
- Photography that was taken before 1954 is available from:
National Archives & Records Administration
Customer Services
8601 Adelphi Road
College Park, MD 20740-6001
Phone: 866-272-3622
Fax: 301-837-3622
Web Address <http://www.archives.gov>
email: carto@nara.gov
- Scanned photographs are not georegistered.
- Scanned photographs are in TIFF format.

National Agriculture Imaging Program (NAIP)

NAIP Products

1-meter NAIP products have a GSD (ground sample distance) of 1 meter. They have a horizontal accuracy of 3 meters with respect to NDOP DOQs. The 1-meter products are currently on a 5-year acquisition cycle.

2-meter NAIP products have a GSD of 2 meters. They have a horizontal accuracy of 10 meters with respect to NDOP DOQs. The 2-meter products are currently on an annual acquisition cycle (except where 1-meter NAIP is being acquired).

Natural Color vs. Color Near-Infrared (CNIR): Natural color and CNIR products are available for some areas. To find out what is available within a specific area, please contact wo_gstc_data_library@fs.fed.us.

How to order:

- NAIP distribution for the Forest Service is done through the Geospatial Service and Technology Center (GSTC).
 - There is currently no specific ordering process for NAIP products, so in the interim, NAIP products are ordered using the GSTC DOQ order form.
 - Fill out the DOQ [Request Form](#) or email the request to wo_gstc_data_library@fs.fed.us with the following information:
 - Name
 - Organization
 - Forest
 - Work phone
 - Email
 - Delivery media (CD or 8 mm tape)
 - Datum NAD83 (NAIP is only available in NAD83)
 - ❖ List of requested data specifying NAIP
 - Job code
 - Shipping address
- NAIP distribution from the Aerial Photography Field Office (APFO)
 - Check the NAIP [ordering website](#) to see a list of available NAIP products.
 - Fill out the [Request for Aerial Photography form](#).
 - Contact APFO directly at 1-801-975-3503

Prices:

- Ordered through GSTC – \$5.00 per CD or 8 mm tape (for data within and immediately surrounding a forest boundary)
- Ordered through APFO – \$50.00 per CD (for data that may not be covered within forest boundaries)
- Some NAIP sponsors offer their copy at no charge (for data that may not be covered within forest boundaries).

National Agriculture Imaging Program (NAIP)

Notes:

- NAIP products do **not** conform to National Map Accuracy Standards (NMAS).
- Products are available in two formats:
 - Compressed county mosaic – MrSid
 - Quarter quad – GeoTIFF (distributed by GSTC)

Links:

[NAIP home page](#)

[APFO aerial photography order form](#)

[DOQ request page](#)

[DOQ request form](#)

Hyperion

Spatial Characteristics

The Hyperion sensor aboard the EO-1 satellite provides continuous spectral coverage over 220 bands, with a ground sample distance (GSD) of 30 meters for all bands. Each Hyperion scene is collected as a narrow strip, covering a ground area approximately 7.7 km in the across-track direction, and 42 km or 185 km in the along-track direction (depending on the original data acquisition request). For more information on the geographic coverage area for Hyperion, see [Orbit and Data Coverage](#).

Spectral Characteristics

The Hyperion instrument collects a 10-nm (average) sampling interval over the contiguous reflected spectrum from 356 to 2,577 nm, although not all collected channels are calibrated (see below). The data is acquired from two separate push-broom imaging spectrometers: one visible (VNIR) spectrometer and one short-wave infrared (SWIR) spectrometer. There is an area of spectral overlap between the two spectrometers from 852 to 1,058 nm.

Hyperion Products

Level 1R Product: The Hyperion sensor collects hyperspectral image data over the continuous spectrum from 356 to 2,577 nm at a spatial resolution of 30 meters. The data product distributed by the USGS EROS Data Center (EDC) consists of radiometrically corrected (Level 1R) data. There is no geometric correction applied and the data will not be georeferenced.

How to order:

- All publicly available archived Hyperion scenes can be searched and ordered through [Earth Explorer](#) or [GloVis](#).
- To request an acquisition from Hyperion, a [Data Acquisition Request](#) (DAR) form should be submitted 30 days in advance of the acquisition date.

Prices:

- Archive orders – Level1R: \$250
- Data acquisition request:
 - 42 km strip – \$1,800
 - 185 km strip – \$2,800

Notes:

- Because Hyperion is a tasking sensor, it collects only when ordered. It does not provide continuous coverage of the Earth, and archived data may not contain coverage of your area of interest.
- A request submitted within 14 days of acquisition will be subject to additional costs.
- The Level 1R data is provided in Hierarchical Data Format (HDF) version 4.1r5.

Hyperion

Links to EO-1 and Hyperion

[EO-1 Users Guide](#)

[EO-1 home page](#)

[EO-1 FAQ page](#)

[EO-1 Hyperion page](#)

[DAR Instructions and Pricing](#)

[DAR form](#)

For further assistance, please contact:

Customer Service

U.S. Geologic Survey

EROS Data Center

Tel: 1-800-252-4547

Tel: 1-605-594-6151

Fax: 1-605-594-6589

Email: custserv@usgs.gov

AVIRIS

Airborne Visible/Infrared Imaging Spectrometer

AVIRIS is a unique optical sensor that delivers calibrated images of the upwelling spectral radiance in 224 contiguous spectral bands with wavelengths from 400 to 2,500 nm. AVIRIS has been flown on two aircraft platforms: a NASA ER-2 jet and the Twin Otter turboprop. The ER-2 is a U2 aircraft modified for increased performance that flies at approximately 20 km above sea level resulting in a 20 m GSD. The Twin Otter aircraft flies at 4 km above ground level resulting in a 4 m GSD. AVIRIS has flown all across the U.S., plus Canada and Europe.

How to order:

- Check the [AVIRIS quicklooks](#) to see if data is available.
- Fill out the [Request Form](#)
 - Name
 - Organization/affiliation
 - Address
 - Email
 - Work phone
 - List of desired flightlines
 - Delivery media (DVD/FTP)

Price:

- Archived data – \$500 per flightline

Links:

[AVIRIS home page](#)
[AVIRIS Quicklooks](#)

Appendix

Landsat 7 SLC-Off Background

An instrument malfunction occurred onboard Landsat 7 on May 31, 2003. Failure of the Scan Line Corrector (SLC), which compensates for the forward motion of the satellite, occurred. Subsequent efforts to recover the SLC were not successful, and the problem appears to be permanent. Without an operating SLC, the ETM+ line of sight now traces a zig-zag pattern along the satellite ground track (figure 1).

The Landsat 7 Enhanced Thematic Mapper Plus (ETM+) is still capable of acquiring useful image data with the SLC turned off, particularly within the central portion of any given scene. Landsat 7 ETM+ therefore continues to acquire image data in the "SLC-off" mode. *Please note that all Landsat 7 SLC-off data will be of the same radiometric and geometric quality compared to data collected prior to the SLC failure.*

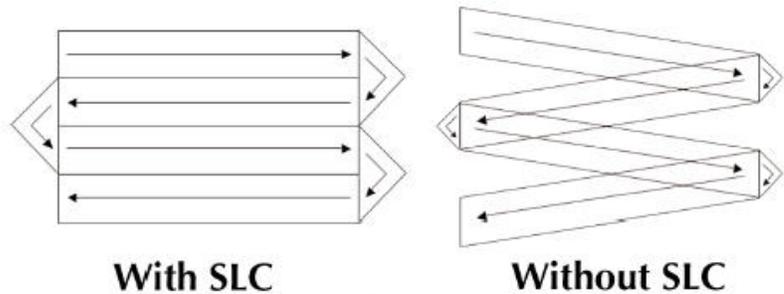


Figure 1. SLC Failure

The SLC-off impact is most pronounced along the edge of the scene and gradually diminishes toward the center of the scene (figure 2). The middle of the scene (approximately 22 km with an L1G product) contains very little duplication or data loss, and this region should be very similar in quality to previous ("SLC-on") Landsat 7 image data.

The primary difference between an SLC-off Landsat 7 product and data collected prior to the SLC failure is the presence of duplicated data in the SLC-off image for Level Zero Reformatted (L0Rp) and Level One Radiometrically Corrected (L1R) data. In the case of a

Level 1 Geometrically Corrected (L1G) product, the USGS processing systems use a variety of methods to replace the duplicated image data.

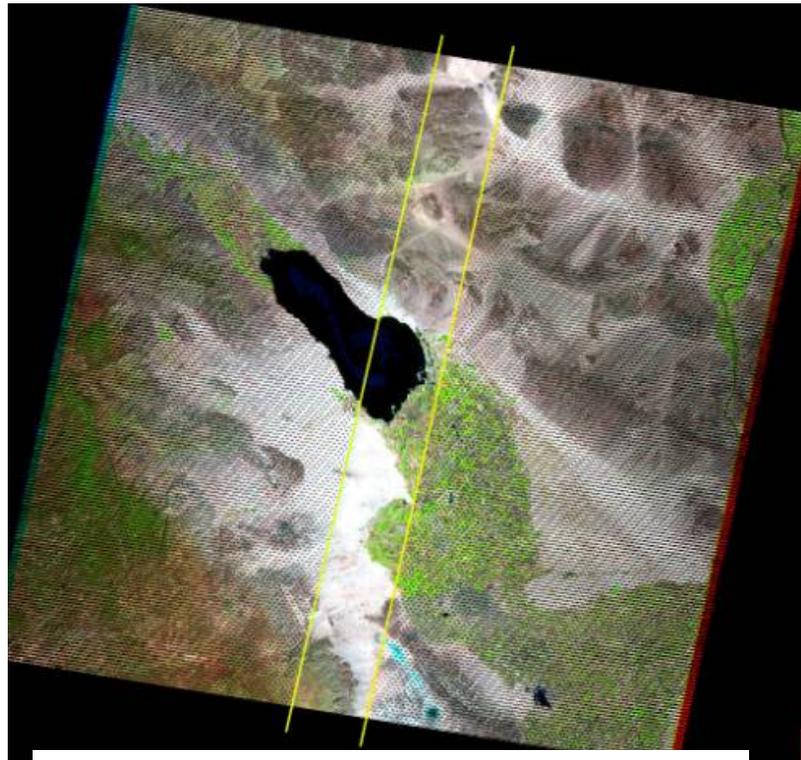


Figure 2. Complete Landsat 7 scene showing affected vs. unaffected area.

Appendix

Landsat 7 SLC-Off Background

The total loss of image data is estimated to be approximately 22% over any given scene. The maximum width of the data gaps along the edge of the image (or duplicated data in the case of L0Rp or L1R) would be equivalent to one full scan line, or approximately 390 to 450 meters. The precise location of the missing scan lines will vary from scene to scene.

Appendix

EOS Data Center Instructions

It is best if you are a registered user. It takes only a few moments to fill out the online registration.

After logging in to the EOS Data Center:

1. Choose Datasets

- Select a sensor from the lists of radio buttons.
- Select (highlight) the products you are interested in. (You can select more than one product by holding down the CTRL key.)

2. Choose a Data Search Type

- Can be left as Primary Data Search.

3. Choose Search Area

- Select the **Type in Lat/Lon Range** radio button.
- Enter a range of latitudes and longitudes to specify your search region. Formats are: *degree* or *degree:minute* or *degree:minute:second*.

4. Choose a Date/Time Range (not required)

- Select the format for entering a date/time (UTC time)
 - i. Standard: YYYY-MM-DD HH:MM
 - ii. Julian: YYYY-DDD HH:MM
 - Annually repeating: If you want to see data for the same time of year you can use this option. This is used in combination with the date/time selection.
 - Example: if you want data for the month of February for years 1993-1995:
Start date/time (UTC): Date: 1993-032 Time: 00:00:00
End date/time (UTC): Date: 1995-059 Time: 23:59:59
Start Day of Year: 032 (February 1)
Stop Day of Year: 059 (February 28)

5. Choose Additional Options (not required)

- This allows you to specify some miscellaneous options about the data.

6. START Search

- This will bring up all of the available granules.

7. Simply follow the rest of the steps to finish the order and designate the delivery process.

Links:

[Earth Observing System Data Gateway.](#)

Acronym Glossary

ALI – Advanced Land Imager

AOI – Area of interest

ASTER – Advanced Spaceborne Thermal Emission and Reflection Radiometer

AVHRR – Advanced Very High Resolution Radiometer

AVIRIS – Airborne Visible/Infrared Imaging Spectrometer

AWiFS – Advanced Wide Field Sensor

CD – Compact Disk

DAR – Data Acquisition Request

DEM – Digital Elevation Model

DN – Digital Number

DOQ – Digital Orthophoto Quadrangle

DOQQ – Digital Orthophoto Quarter Quadrangle

EDC – EROS Data Center

EFF – EOS at Fast Format

EOS – Earth Observing System

ETM+ – Enhanced Thematic Mapper Plus

FIA – Forest Inventory and Analysis

FS – Forest Service

FTP – File Transfer Protocol

GCP – Ground Control Points

HDF – Hierarchical Data Format

GPR – General Programming Request

GSD – Ground Sampling Distance

Acronym Glossary

IRS – India Remote Sensing

MODIS – Moderate Resolution Imaging Spectrometer

MRLC – Multi-Resolution Land Characteristics

NAD27 – 1927 North American Datum

NAD83 – 1983 North American Datum

NAIP – National Agriculture Imaging Program

NASA – National Aeronautic and Space Administration

NLAPS – National Landsat Archive Processing System

NMAS – National Map Accuracy Standards

RSAC – Remote Sensing Applications Center

SLC – Scan Line Corrector

SPOT – Satellite Probatoire d’Observation de la Terre

SWIR – Shortwave Infrared

TIFF – Tag Image File Format

TM – Thematic Mapper

USDA – United States Department of Agriculture

USGS – United States Geological Survey

UTM – Universal Transverse Mercator

VNIR – Visible/Near Infrared

WGS84 – 1984 World Geodetic System

WiFS – Wide Field Sensor

WRS – Worldwide Reference System